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Three major presentations made at an October 1968 conference at Hartland, Michigan, for public school administrators and university professors are "The Systems Movement and Educational Administration," by Glenn L. Immegart; "Cost-Utility Analysis and Educational Decision-Making," by Austin D. Swanson; and "Educational Planning, Programming, and Budgeting: A Systems Approach," by Harry J. Hartley. Immegart defines the systems movement, outlines 11 approaches within the field (cybernetics, operations research, etc.), reviews models and procedures, and suggests problems related to use of the systems approach in educational administration. Swanson describes the general input-output model, discusses measurement indexes, explains alternate strategies in subsystem application, and emphasizes optimizing the combined output of subsystems. Hartley outlines the present limitations of the systems approach in local schools, compares various stages of budgetary reform with traditional incremental practices in local school planning, portrays the primary conceptual and operational elements of PPBS, and describes three program budgeting installations: Dade County, New York City, and Sacramento. Bibliographies are appended. (JK)

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Systems Approaches To The Management of Public Education

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FOREWORD

The Metropolitan Detroit Bureau of School Studies, Inc., through its Committee for the Improvement of Professional Management sponsored a conference on Systems Approaches to the Management of Public Education held on October 29–30, 1968 at Waldenwoods Conference Center, Hartland, Michigan.

This professional development program was designed to provide public school administrators and university professors with opportunities to analyze the existing situation and possible changes that lie ahead in the approaches to the management of public education. Approximately 70 participants (mainly school superintendents, assistant superintendents, and university professors) from the Metropolitan Detroit Six County Area were involved in the conference.

Three major presentations were made during the two-day conference. All three were directly related to systems approaches to public school management and/or the need to reform the budgeting practices of local school districts. The content of this publication is taken in part from the transcripts of the conference proceedings and in part from submitted manuscripts.

Deserving special mention for their work in assisting with the development and implementation of this professional inservice program are the following members of the Committee for the Improvement of Professional Management:

Jerry De Grow, Superintendent, Port Huron Public Schools
Ken Kistner, Superintendent, Fitzgerald Public Schools
Bob Klingman, Superintendent, Lakeview Public Schools
Doug Lund, Superintendent, Rochester Public Schools
Thomas Vaughan, Superintendent, Heintzen Public Schools
Fred Bertolaet, Professor, University of Michigan
Elven Duvall, Professor, Eastern Michigan University
Carroll Munshaw, Professor, Wayne State University

Special note is also made of the significant contributions of the staff of the Metropolitan Detroit Bureau of School Studies, Inc., namely: Bob Esko, Chuck Ferguson, and Fira Kotz.

Gerald G. Mansergh
Executive Director, MDBSS
and Conference Coordinator

THE SYSTEMS MOVEMENT
and EDUCATIONAL ADMINISTRATION

by
Glenn L. Immegart
Associate Professor of Educational Administration
University of Rochester (New York)

The task of administering an educational organization today is indeed formidable. Growing enrollments, increasing size of educational organizations, expanding role-function, larger staffs, and a snowballing educational technology all contribute to this challenge. Likewise, shifts in the financial bases of education, modifications in the decision making structures for education, and such vital current concerns as negotiating with teachers' groups, seeking the equality of educational opportunity for all, and the changing state and federal roles for education each as well add their share to the magnitude of the job of administering education.

Administrative science has helped educational administrators to meet these challenges through the study of administration and organization, and the development of improved administrative procedures and techniques. Administrative science has also provided concepts and content for improved training programs for administrators. To the extent that this has been effective, the administrator's job has been facilitated. However, many are raising the question: Have we done enough? With all of the advances made by administrative science, the educational administrator still typically does not think big thoughts about big things, come up with creative solutions to pervasive problems, or practice much "preventive" administration. In fact, most are happy to "keep up with the brushfires", putting them out one at a time.

Maybe this is just administrative life--maybe there is no other way. Possibly, however, this neednot be so. The systems movement, for example, offers a real, and as yet somewhat untried, potential for improving the practice of educational administration. In particular, the systems movement offers a perspective for the administrator that, in and of itself, can facilitate his job. The systems movement has also resulted in numerous techniques, procedures, and methodology (which can be discussed and classified as management support systems) that can greatly relieve many of the burdensome aspects of administering. Available in the systems movement are ways to free the educational administrator so that he can cope with some of the more important matters that face him.

At the outset the bias of this presentation should be apparent. The systems movement has a great deal of promise for the study, development, and practice of educational administration. That we have not yet drawn sufficiently on this movement is attested by the need for this conference on "Systems Approaches to the Management of Public Education". Before exploring such approaches in detail (since there has not really been extensive dialogue in educational administration circles on "systems"), we might best begin by looking at the systems movement in general and its relevance for educational administration.

I will, therefore, be less concerned with the specific application aspect of the conference.

Rather, my remarks will (a) introduce the conference to "systems", (b) provide hopefully some background for the papers that are to follow, and (c) open up initial discussions on the relevance of systems approaches for educational administration. More directly, I will seek (1) to set forth the "essence" of the systems movement, (2) to identify the various forms or approaches systems thinking has taken, (3) to illustrate a number of specific systems contributions that have relevance for educational administration, and (4) to discuss some of the major problems of drawing upon the systems movement (that is, applying systems thinking and techniques to the administration of public education.) My approach will be indicative and focused toward "opening up" the area and prompting discussion.

The Essence of the Systems Movement

Systems terminology and concepts are sufficiently in vogue that they are fast becoming "universals" in a number of areas of scientific endeavor and fields of practice as well as in our society at large. This is neither by accident, nor totally by design. But, as is true with any vogue, there exists a certain popular conception (of systems) which is, and again typically is, somewhat vague and imprecise. It seems important, therefore, that we try to get at the heart of the concept or movement "systems" and attempt to make sense out of it.

There is no need to endeavor to set forth the properties, dimensions, or canons of that popularly referred to as systems theory since this has already been done and probably has been belabored too much. Instead, we might better try to glean from the systems literature the gist of systems thinking. It has already been pointed out in the literature that definitions and terminology in this area should not be taken too seriously. To grasp meaning (understand) we might better rely more on exploring the essential characteristics of systems thinking and, possibly more precisely, the mind set of the systems' scientist.

What then is the "essence" of the systems movement? First of all it should be made clear that it is not a theory—that is, not a systems theory or General Systems Theory or what-have-you. Actually there is, at least to my knowledge, no such thing as systems theory in the sense of the word "theory" as used by the sophisticated theoretician. Although there is much that approaches "theory", there is, in fact, no single, all-inclusive, universally accepted, and well-enunciated body of knowledge that can be emphatically called systems theory.

Rather, and more importantly, what the systems movement has produced is a mode of thought. This mode of thought can be characterized as cross-disciplinary, or inter-disciplinary, in nature. It is rich in both perspective and conceptual apparatus. Systems thought or systems thinking provides a viable approach to asking and answering questions. In a sense it offers a "perspective on uncertainty".

Systems thought is holistic thought; it is contextual thought. Not only does the systems view focus on wholes and relevant (component) parts, but also this view is concerned with environmental context. By definition open systems exist and flourish in a dynamic exchange relationship with their environment(s).

Most simply and most pointedly, systems thought is systematic, relational thought. That is, it is thought—the conscious process of reflection. Secondly, it is systematic—methodical, coherent, designed, and analytic in nature. Finally, it is relational—it accounts for referents, connections, interconnections, and direction.

To illustrate, we might look briefly at the application of systems thought to a typical administrative problem, one of an administrator's replacing a teacher in mid-February as a result of her husband's employment transfer on short notice to another state. There are several standard or "stock" solutions to this problem: (1) hire a new full-time teacher (e.g., a January graduate from State U., someone new to the area, or whatever), (2) employ a substitute until an acceptable full-time teacher can be employed, (3) hire a substitute to finish out the school year, or (4) use several substitutes as available to finish out the year. Most administrators would most likely take a typical or experentially tested solution and implement it. They would in all probability react in a reflexive or preconditioned way. The principal using the systems approach would proceed somewhat differently. First, he would set forth the criteria to be employed in selecting a replacement. He would then, secondly, entertain all possible alternative solutions to the problem situation. Further, he would consider certain relationships such as those of (1) the outgoing teacher and the replacement, (2) this emergency staffing problem to next year's building staffing needs, and (3) the incoming teacher to the pupils in the room. Aware of the relatively low probability of an "ideal" solution, he would proceed to assess the relative time, cost, and benefit aspects of the situation. A temporary substitute might be employed or maybe a candidate "tested" as the "systems administrator" worked toward a solution.

The administrator could, through analysis of subjective probability, including time-cost-benefit considerations and other relevant criteria, select the most desirable solution (optimization) to his problem. Rather than a conditioned response, hurried action, or ill-considered alternative, the systems approach would yield a decision resulting from systematic, relational thought.

Systems thought has a number of advantages as an analytic framework. First, it has provided an approach to functional (behavioral) analysis in terms of antecedent conditions and developmental trends. Phenomena in the systems perspective are viewed not as isolated events but instead are assessed in context in a chronological sense. Put another way, the systems perspective places import in the evolutional aspects of all dynamics and phenomena, and concerns itself with behavior or function in an unfolding, irreversible time sequence. It is concerned with linkages and patterns in time space.

Systems thought has also provided an approach to structural analysis in terms of relationships and connections. Structures in this perspective are not, therefore, abstracted or superimposed but are analyzed through empirical referents, real proximity and juxtaposition, relevant factors and parameters[2] and pertinent connections or interfaces.

The systems movement also offers an approach that is ultimately operational. A system problem or pathology is not mechanical, psychological, or sociological; rather, these are ways of looking at a system problem. In this sense problems are simply dysfunctional

aspects of systems. To solve them one must look at the system and the forces affecting it, and then ask and answer the right questions. (These are the ones that make a difference.)

The systems perspective is, further, futuristic–that is, one that projects developmentally. Whether improving an existing system or creating a new one, use of the systems approach focuses on what will be. For example, tradition and the past are important only as antecedent conditions because time, relative to open systems, is non-reversible–optimizing what will be is the task.

Systems thought as well provides a realistic departure for manipulating variables in a complex context. The systems analyst is aware of the scarcity of materials and energy, and, while seeking system maximization through optimization or sub-optimization, explores rigorously the relative costs and benefits of alternatives. End results are not viewed through rose-colored glasses but are pragmatically assessed in terms of relevant conditions and ultimate pay-offs. Additionally, such matters are not entertained per se but are viewed in relation to all other categories of cost and gain impinging at a given time or in the foreseeable future.

Finally, the systems movement has provided a unifying force for practice, development, and inquiry. As implied, systems thinking spans a number of disciplines and has brought together the efforts of scholars from a number of fields. Together these scholars have explored common and unique problems, have bridged the gap between traditional fields, and have established a useful rubric for attacking proble .

In sum, the systems movement, has resulted in a cross-disciplinary mode of thought that has yielded a heuristic perspective on reality. This mode of thought–systematic, relational thinking–offers a unique approach to practice, development, and science. It provides a useful approach for dealing with complex, unfolding dynamics, including many of the problems and dilemmas that face the school administrator.

With this somewhat generalized attempt to set forth the essence of "systems", we can now turn to the various forms systems thought has taken, a look at the development of systems ideas and concepts.

The Forms Systems Thinking Has Taken

The major lines or approaches systems thinking has taken are the following:

1. General Systems Theory
2. Cybernetics
3. Holism
4. Operations Research
5. Systems Design
6. Information Theory
7. Systems Analysis
8. Systems Engineering

9. Output Analysis
10. Mathematical Programming
11. Computer Science

General Systems Theory or systems theory is the label given to describe a level of theoretical model-building which lies somewhere between the highly generalized constructions of pure mathematics and the specific theories of the specialized disciplines. Of interest to General Systems scholars are the nature of systems, the universality of systems properties and states, and the generalization of scientific findings from one category of systems to another.

Cybernetics represents the movement within the generic framework of systems thought that holds that humans and society can be best understood through the study of the messages and communication facilities which belong to them.[3] It is the thesis of cybernetics that any system can be effectively analyzed through the communication and control activities of the system. Cyberneticians have sought to develop a language and techniques to attack and deal precisely with the problems of control and communication.

Holism is the branch of the systems movement centered in continental Europe. This approach is quite similar to the General Systems movement in terms of its interdisciplinary emphasis and truly generic focus (as contrasted to the precise focus of cybernetics). It is different from General System Theory in that it tends to incorporate to a greater extent the concerns of philosophy, theology, and the humanities (along with the social, behavioral, and physical sciences).

Operations Research represents the first attempt in the general systems movement to move to applied practice. Operations Research, or O.R., as it is popularly known, "is concerned with increasing the effectiveness of operations of man-machine systems".[4] According to Churchman its objective is to provide managers of an organization with a scientific basis for solving problems involving the interaction of components of the organization in the best interests of the organization as a whole.[5] It is the application of interdisciplinary science to organizational decision making. The process includes research on problems of organized systems to provide solutions which best serve the organization as a whole (or major part of it as a whole) by interdisciplinary teams through the use of the scientific method.

Systems Design represents an outgrowth of the General Systems Theory emphasis and the Operations Research movement. It is inter-disciplinary and based in the generalizability of systems findings, but in contrast to Operations Research is less concerned with what is and rather is concerned with the creative development and structuring of new, different, and unique systems.

A direct outgrowth of Cybernetics and the first purely quantitative branch of the systems movement is **Information Theory**. Information Theory is now about 15 years old. Originally developed for problems in communications engineering it has more recently been applied to telephone communications and radar as well as, less sophisticatedly, to a variety

of information systems in machines and organizations. It has been observed that the possibility of defining information quantitatively improves one's chances of making the right guess.

Systems Analysis is a refined "systems" process for business and industrial problem solving. Operations Research and systems analysis are often equated and/or confused. Operations Research is oriented primarily to human systems (organizations) while systems analysis is concerned with mechanical and man-machine systems. Involved in systems analysis is (1) systems decomposition (analysis) or the dissection of a system and (2) the resulting systems synthesis (often, systems design) into another whole system. Of import are components, functions, activities, and relationships and the restructuring of these based on interdisciplinary scientific analysis and projection.

Systems Engineering is a product of Operations Research, the somewhat more subjective Systems Design approach, and the general development of engineering science. As such it has a disciplinary flavor (further attested to by its label) and increasingly represents a growing body of knowledge and professional pursuit in and of itself. Systems Engineering is "a creative process in a time series of actions or events which leads to a novel system that satisfies the objectives of a group at some point in time".[7]

Output Analysis, though a highly specialized branch of Systems Analysis, bears some mentioning since this form of systems activity has been well enunciated and operationalized in the past few years.[8] This form of analysis holds that a system (organization) can best be studied in terms of the results of its actions (activity). The focus is, thus, on (1) output or outcome, (2) the evaluation of output, and (3) subsequent feedback to the system as to how its operations and processes can be altered or restructured to better achieve system goals.

One of the most widely known and successfully applied quantitative techniques in management decision making is **Mathematical Programming**.[9] It has been applied to a variety of problems from transportation management to investment portfolios. With obvious antecedents in the science of mathematics, the use of Mathematical Programming in the systems movement resulted from a need for increasing quantification and more accurate prediction wherever possible in O.R., Systems Design, and Systems Engineering. It has proved to be an effective method of finding optimum allocation schemes for a number of classes of problems such as production scheduling and worker deployment.

Lastly, **Computer Science** represents a highly technical and applied aspect of the systems movement. Little elaboration is needed here since of all the outcomes of the systems movement and systems related activity, the computer and computer science is probably best known. It should, nonetheless, be pointed out that while we in educational administration have seen and used its scheduling potential, we have done little to explore other computer possibilities such as the computer's potential for facilitating organizational decision making. [10]

The Potential of "Systems" for Educational Administration

The movement just sketched has great relevance and potential for educational administration. This relevance is both in respect to the more general aspects of the profession of educational administration and to more specific administrative practices. We will, however, concentrate on the latter.

But before examining some of the specific contributions of the systems movement with relevance for the management of public education, we should first look at the more general implications of the movement for administrative practice. Most relevant for the "practitioner" is simply the systems perspective. To the extent that any practitioner can understand the systems mode of thought and apply it in his work his task will be facilitated. For, systems thinking will force him to look at the totality of situations or problems, to take a long range view regarding his organization, to analyze consciously antecedent conditions and possible effects, to be cognizant of relations and connections in the life space of the organization, to utilize cost-utility approaches to choice, and to optimize (maximize) for the total organization. Hopefully, his predictive power will be enhanced through a more skillful approach and an improved ability to deal with uncertainty. Lastly, the many heuristic vehicles, procedures, and tools borne by the systems movement to which we will now turn can contribute to the facilitation of administrative practice.

Some Specific Contributions of the Systems Movement

The "systems" movement has prompted a number of specific management devices that can contribute greatly to the practice of educational administration. Such can be referred to as "management support systems" and purport to do exactly what this label implies. Systems devices in this sense can be categorized (somewhat arbitrarily) as "models," "procedures", and "techniques". It should be obvious that for the most part we in educational administration have yet to capitalize to any real extent on these products of the systems movement.

Some models resulting from the systems movement with relevance for the administration of educational organizations are:

1. **The "Black Box" Model.** Ashby's classic input-output process model provides an analytic device that graphically shows that outcomes of system activity are the results of system inputs and system processes, and further, that feedback is the evaluative or monitoring process through which a system modifies and/or improves subsequent outputs through system input and process adjustment.[11]

2. **Output Analysis.** Optner in his work relative to business and industrial problem solving has derived a comprehensive and detailed scheme (model) for attacking management problems through the application of systems analysis techniques to the control functions in organizational decision making.[12]

3. **An Outcome Analysis Scheme.** Related to Optner's approach but somewhat

more subjective, is a scheme developed in a recent research project that can be applied in assessing the multidimensionality of the outcomes of organizational activity. This model can be used to assess the extent to which productivity, organizational integration, organizational health, and feedback (evaluation) are present in organizational outcomes.[13]

4. **Mathematical Models.** The mathematical programming movement has resulted in an array of linear, integer, stochastic, and dynamic programming techniques that may be applied to organizational problems. The value of the use of mathematical equations to solve problems of resource allocation, personnel deployment, and a host of other problems has already been demonstrated.[14]

5. **Simulations.** Management science (using systems approaches) has developed a number of simulations through which organizations or organizational components have been modeled and decision alternatives are tested to assess their outcome and effect on the system and its goals. Through these procedures, variables can be controlled and varied, and effects assessed in a rapid time reduction sequence. Also, simulations permit the manipulation of vast arrays of variables that would be too numerous and complex for human solution [15]

6. **Political Decision Model.** Easton's work in political science using systems concepts and principles has resulted in a systems model of group decision making. The model has relevance and implications for group decisions in any context and suggests guidelines for group decision making in the organizational setting as well as in the larger societal arena for which it was intended.[16]

7. **A Communications Model.** Churchman has explicated a communications model for analyzing business organizations. The model accounts for (1) organizational communication network(s), (2) knowledge of the goal-directing processes of organizational control, and (3) knowledge of goal-changing processes.[17] The model and its components have been operationalized and could be applied in the study of educational organizations.

Some of the procedures growing out of the systems movement that can facilitate the practice of educational administration are the following:

1. **The Critical Path Method.** The critical path method, or PERT as it is more recently referred to, is "a powerful but basically simple technique for analyzing, planning and scheduling large, complex projects.[18] This procedure involves breaking a project into its component parts or activities, determining which of these are "critical", and then scheduling the project in terms of its parts or subactivities in order to meet a target time at minimum cost. CPM can be applied to the construction of a building, the production of a play, a developmental project, or to a reasearch study.

2. **The Planning, Programming, Budgeting System.** PPBS is an outgrowth of military planning and decision making and has had wide application in government circles and most recently in University planning. PPBS involves (1) budgeting by programs rather than the traditional objects of expenditure, and (2) the extension of programs "far enough in the

future to show to the extent practical and necessary the full resource requirements and financial implications of the programmed outputs.[19] Such planning examines the relative merits of alternatives and projects fiscally the projects beyond the normal year by year budgetary planning of educational organizations.

3. **Computer Programming.** Already use of computers in scheduling and somewhat in information storage and retrieval has found acceptance in educational organizations. The utilization of computers has not, however, been extended fully to such matters as organizational information systems, personnel deployment, personnel records, organizational research or similar fields where applications could well be made.[20]

4. **Linear Programming.** Through the use of linear equations (linear programming), solutions to problems involving two quantifiable interacting variables can be obtained. Applications have been made in the areas of traffic control, transportation scheduling, and work scheduling.[21]

5. **Transportation Scheduling System.** Recently developed and applied to the routing of bakery and dry cleaners trucks, the IBM Vehicle Scheduling Program has potential applicability to the routing of school buses.[22]

6. **Cost-Benefit Analysis.** Cost-benefit analysis has been used extensively in Operations Research and Systems Analysis. Its potential for applications in educational decision making are abundant considering the scarcity of resources and the corresponding need to maximize the results or products of educational organizations.[23] Involved are the relative pay-offs of alternate procedures and the establishment of criteria for maximizing choices.

Finally, a number of specific management techniques have emanated from the systems movement and, more precisely, the models and procedures already discussed. A few of these are:

1. The flow chart.
2. Automated manpower inventory systems for personnel selection, deployment, and evaluation.
3. Instructional systems for both delimited and extensive training needs.
4. Information storage and retrieval systems.
5. Inventory control systems.
6. Management information systems.

Some Problems

All in all the systems movement is rich in potential for educational administration. It provides a mode of thought, viable concepts, and a number of management tools that can be of benefit to the field of educational administration. However, before we look to the systems movement as a source of solutions to all of our problems or blindly begin to adopt its approaches, methodology, or tools we ought to recognize some of the problems that bear upon

using "systems" in educational administration or any other applied field.

There is grave danger in viewing the systems movement as a panacea or "cure-all". Rather, the products of the systems movement might be viewed as facilitators or "freers" for educational administrators. In a sense, the systems movement enables us to ask better questions and seek better answers. Also, it provides us with a number of tested procedures and tools for solving some of our problems. To the extent that educational administrators utilize management support systems, they will be free to explore the more knotty and emerging problems of our times. But certainly by no stretch of the imagination do systems approaches yield all of the answers. There are many categories of management problems not amenable to systems techniques or for which the techniques lack sufficient refinement. "Systems" as a movement is itself young and emerging.

One problem in borrowing from the systems movement relates to the appropriateness of systems models and procedures for the dynamics and variables with which the administrator deals. We in administration must be critical and must carefully assess the potential of each notion or device we seek to use. We need to be cautious not to borrow without adequate clarification by the "systems expert" as well. To the extent that systems models and procedures need adaptation we must be aware of the possible loss inherent in the adaptation process. It is imperative that applications not be forced and that we are aware of what the models and procedures we borrow can do and cannot do. Systems vehicles, as all others, have their limits, a relative scope of applicability, and inherent limitations.

Another potential problem in capitalizing on the systems movement can be an over-zealous preoccupation with the mathematical aspects of the systems movement. "Over-sophistication" and the desire to be empirical and quantitative can well get in the way of applied practice. If the phenomena of the world of practice are isomorphic to the mathematical procedures used in some of the more rigorous systems approaches, the problem does not exist. But, of course, mathematics does not yet have the capacity to provide models for all phenomena or sets of phenomena. Thus, we need to realize that the quantified systems approaches cannot solve all problems and, equally important, that the systems movement has numerous approaches that can facilitate prediction and dealing with uncertainty that are less quantifiable, more subjective, but nonetheless systematic and rigorous in a logical sense.

In looking to the systems movement, we must further avoid a preoccupation with models, procedures, techniques, and terminology per se. More important are the principles and processes (methodology) of systems scholars and the "mind set" or mode of thought these scholars employ in scientific and applied activity. We need to guard against long intellectual discussions and push toward implementation of systems approaches in educational administration.

The "traditionalists" among us pose another problem in drawing upon systems knowledge. Although one gets the strong feeling that the systems approach is ultimately common-sensical, it can be anticipated that widespread acceptance of systems ideas and devices will not be immediately forthcoming. It can be hoped that this is due to a natural resistance to

different ways of thinking as opposed to the possibility that we are nonsensical, or our area of practice is. Implementing even the most blatantly useful systems models and procedures will be no less difficult than promulgating new instructional methodology, changing preparation programs, or accepting the fact that we have little inkling yet as to what makes a "good" administrator. Like anything else, systems approaches can be a threat to people—to their values and traditional approaches.

In addition many of us lack the experience within the field and the expertise within our local districts to pursue these approaches. A conference such as this is a beginning to approaching these two problems.

Lastly, there is the problem of just plain getting started. We have talked a great deal and maybe some of us will have talked enough by the end of this conference that we should begin to do something. We will see in subsequent presentations that some are getting started. It remains now for the rest of us that see relevance in the systems movement for educational administration to do something about it.

In conclusion, this presentation has sought to explore the "essence" of the systems movement—in a capsule, systematic, relational thought; to identify the major lines of development in the systems movement; to set forth the relevance of the systems movement for research, theory building, practice, and preparation in administration; to suggest a number of systems models, procedures, and techniques that can facilitate the practice of administration; and finally to focus on a few of the problems of using systems ideas and approaches in educational administration. Hopefully, the relevance of the systems movement has been indicated and the suggested systems devices further reinforce a growing desire to draw upon "systems" toward the goal of improving the practice of administration in educational organizations.

FOOTNOTES

1. C. J. Hitch, "Uncertainties in Operations Research", **Operations Research,** Vol. VIII, No. 4 (July-August 1960) pp. 437–45.

2. Variables within a system can be referred to as factors, and variables external to a system can be termed parameters.

3. N. Wiener, "Cybernetics", in S. Ulmer, **Introductory Readings in Political Science.** Chicago: Rand McNally, 1961, pp. 298–306.
See also N. Wiener, **The Human Use of Human Beings.** Boston: Houghton Mifflin, 1950.

4. R. L. Ackoff "Systems, Organizations and Interdisciplinary Research", **General Systems,** Vol. V (1960), p. 1.

5. C. W. Churchman, R. L. Ackoff, and E. L. Arnoff. **Introduction to Operations Research.** New York: John Wiley, 1957, p. 6.

6. S. L. Optner. **Systems Analysis for Business and Industrial Problem Solving.** Englewood Cliffs: Prentice Hall, 1965.

7. A. D. Hall. **A Methodology for Systems Engineering.** New York: Nostrand Co., 1962, p. 81.

8. See Optner, **op. cit.**

9. M. Alexis and C. X. Wilson, **Organizational Decision Making.** Englewood Cliffs: Prentice Hall, 1967, p. 224.

10. See J. W. Loughary. **Man-Machine Systems in Education.** New York: Harper and Row, 1966;
P. Allen, **Exploring the Computer,** Reading, Massachusetts: Addison-Wesley, 1967;
J. I. Goodlad, J. F. O'Toole, Jr., and L. L. Tyler. **Computers and Information Systems in Education.** New York: Harcourt, Brace and World, 1966.

11. W. R. Ashby. **An Introduction to Cybernetics.** New York: John Wiley and Sons, 1956, Chapter VI.

12. Optner, **op. cit.**

13. G. L. Immegart, "Systems Theory and Taxonomic Inquiry into Organizational Behavior in Education", in D. E. Griffiths (ed.). **Taxonomies of Organizational Behavior.** Chicago: Rand McNally, (forthcoming).

14. Alexis and Wilson, **op.cit.**, pp. 222–240.

15. See, for example, J. Kagdis and M. R. Lackner, "Introduction to Management Control Systems Research", Technical Memorandum 708/100/00, System Development Corporation, October 16, 1962.

16. Davis Easton, "An Approach to the Analysis of Political Systems", **World Politics.** Vol. 9 (1956-57), pp. 383–400.

17. Churchman, Ackoff and Arnoff, **op.cit.**, Chapter IV.

18. F. K. Levy, G. L. Thompson, and J. D. Wiest, "The ABC's of the Critical Path Method" **Harvard Business Review.** Vol. 4 No. 5 (September-October, 1963), pp. 98–108; D. L. Cook. PERT: **Applications in Education.** Cooperative Research Monograph No. 17, OE-12024, 1966, U. S. Government Printing Office, F55.212:12024.

19. C. J. Hitch, "Program Budgeting", **Datamation.** Vol. 13, No. 9 (September, 1967), pp. 37–40.

20. Although such applications have been suggested and discussed at length in recent years there is little evidence that educational organizations have attempted more than superficial uses of computer technology particularly in regard to management applications.

21. Alexis and Wilson, **op.cit.**, pp. 226ff.

22. "System 1360 Vehicle Scheduling Program Application Description", IBM Technical Publications Department, H20-0464-0, White Plains, New York, 1967.

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COST-UTILITY ANALYSIS AND EDUCATIONAL DECISION-MAKING

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Procedures for comparing the costs of a function with its outcomes have been described by a variety of terms including: cost-benefit analysis, cost-effectiveness analysis, operations research, operations analysis, cost-quality analysis, etc. Within the context of this paper, these terms hold approximately the same meaning. For consistency the term "cost-utility analysis" will be used.

Cost-utility analysis bears the same meaning when applied to education as it does for other areas of human endeavor. It is an effort to discover ways whereby desired objectives (i.e. output) may be reached with a minimum application of resources (i.e. cost) or whereby desired objectives may most nearly be reached given a specific amount of resources. To the present, cost-utility analysis has been used primarily with respect to economic objectives. Recently interest has increased in also using it with respect to social objectives. This is especially true in the Federal Government. Robert McNamara's use of cost-utility analysis to assist decision-makers in the Defense Department in arriving at better courses of action has been widely heralded. The total decision-making process in the Defense Department is known as Planning, Programming, Budgeting Systems (PPBS) of which cost-utility analysis is an important support subsystem.

Cost-utility analysis does not make decisions. It's purpose is to only make available and arrange data in such a fashion as to sharpen the judgments of decision-makers. Like individuals and businesses, all levels of government are constrained by the scarcity of economic resources at their disposal. There is a continuing need to analyze policy and to view alternate means of implementing policy against potential outcomes and resources required. Educators have been particularly negligent in making evaluations of this type. They have used as their rationale for not doing so, the complexity of their product and process. As long as education was being supported primarily for altruistic reasons and as long as the resources consumed were relatively small, the public put up with this excuse, but now it is becoming impatient. Education is no longer supported for altruistic reasons alone. Economists have clearly associated expenditures for education with the health and growth of the national economy. The proportion of the G.N.P. devoted to education has increased from 4% to about 7% in a little over 10 years. Thirty percent of the population is connected in its primary occupation with an educational institution. The nation cannot afford to risk inefficient use of these vast resources.

The task is not an easy one. It will never be possible in education to remove judgment or even intuition from the decision-making process, but much can be done to improve the basis for decision-making. It is possible to come up with better methods for framing our problems and for organizing available data – and improve the availability of data. It is also possible to better analyze the information needed to produce decisions.

PPBS is the most sophisticated attempt to date for improving the decision-making process. Its primary task is to rationally order inputs and identifiable outputs so that meaningful comparisons among alternative courses of action may be made. The essential considerations of program budgeting are structural aspects, analytical processes, and data or information support systems. (Fischer 1967) Analytical processes as applied to educational problems is the focus of this paper.

The General Input-Output Model

The general relationship between inputs and outputs is illustrated by Figure 1. The input variables are of two types: those which can be controlled by the system; and those which cannot be controlled by the system but which are environmental in nature. The interaction variables constitute the process by which the elements of input are combined. The output variables are the end results or products of the process.

In applying the model to educational problems the interaction function is treated in a "black box" fashion. The investigator assumes that a change in the input is going to cause a change in the interaction but he is not particularly concerned over what this change is or how it works to effect the output. He is very much concerned, however, in the effect upon the output. Cost-utility analysis relates inputs directly to outputs, by-passing the interaction function.

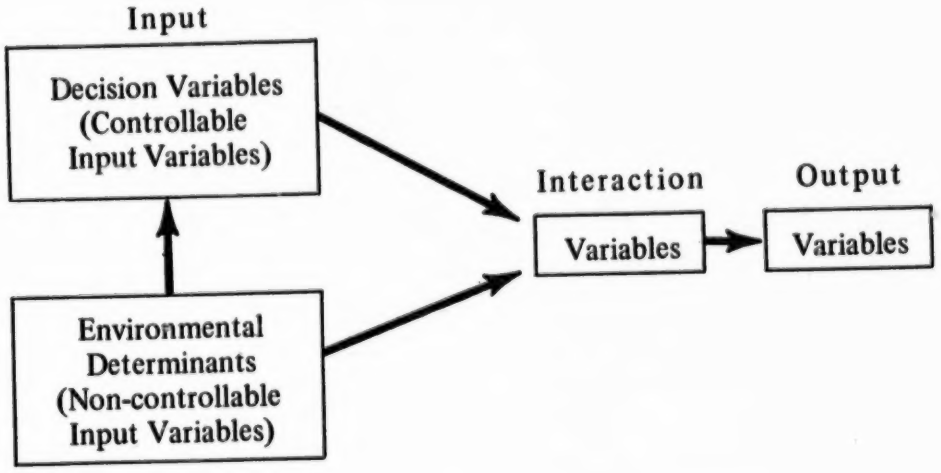

Figure 1. A General Input-Output Model

Environmental Determinants (non-controllable input variables) and Output present a peculiar measurement problem for educational applications. Unlike economic applications, the primary inputs are of a non-controllable nature in educational applications. The chief of these is the children to be educated. The school has virtually no control over who it will admit and yet this has an overwhelming impact on its output. Paul Mort's research attributed about 2/3 of the variation in output to Environmental Determinants leaving only 1/3 of the variation explainable by decisions made by school boards and administrators

(Mort 1960). James Coleman strongly suggests that the effect of Environmental Determinants is even greater (Coleman 1966).

The problem is compounded by the fact that the common measures of output, primarily achievement tests, do not differentiate between that which is controllable such as resource application and that which is environmental such as the socio-economic status of pupils. In a cost-utility analysis it would be inappropriate to use output criteria which cannot be attributed primarily to controllable inputs.

Indexes of socio-economic status such as Project Talent's SEE index and Intelligence Quotients have been used with some success as measures of Environmental Determinants (Flanagan 1966). Once those determinants are quantified there are several design options which are capable of coping with their effect. One of these is to partial out the effect of Environmental Determinants from pupil achievement scores. The output measure then is not pupil achievement but a computed residual with the measured effects of environmental determinants removed. This procedure was explored by Goodman in New York State's Quality Measurement Project and has subsequently been used by Igoe on the same data and by Nephew on Project Talent data (Goodman 1959; Igoe 1968; Nephew 1968). Nephew applied the process to measures of the motives domain as well as to achievement.

Another approach is to limit the variation in Environmental Determinants. In such applications the measured output is still the product of both Decision Variables and Environmental Determinants, but the variation in output can be attributed primarily to Decision Variables. Other approaches would include analysis of covariance procedures where output would be the dependent variable and measured Environmental Determinants would be covariants.

Socio-economic indexes and measured intelligence are highly correlated. Because of the similarity in intelligence tests and achievement tests and since much that is measured in standard intelligence tests is taught, the socio-economic index is preferable as a measure of Environmental Determinants. While socio-economic status appears to be highly correlated with output, its measurement is quite independent of output measurement.

The measures discussed above are measures of product output. Because of the difficulty in separating the product attributable to Decision Variables and that attributable to Environmental Determinants, a second approach has been used which consists of evaluating the quality of services provided by the school with the assumption that the quality of services has a direct educational effect upon pupils. Service output may be measured by a simple count of the presence or absence of certain services of interest to the investigator. More sophisticated process instruments attempt to rate the effectiveness of the services through evaluating their characteristics against generally accepted psychological and sociological principles (Mort 1946; Institute of Administrative Research 1967).

There is a great need for improving measures of output whether they be product or process. Nevertheless the use of existing measurement devices with all their limitations can be greatly increased.

Applications of the general input-output model to the analysis of relationships in school districts are of at least four types. They are classified according to the scope of the interaction studied and according to the nature of the measure of output as shown in Figure 2. Output can be viewed as services produced by the school system (A and C) or in terms of the system's impact upon the learning of its pupils (B and D). The general input-output model may be applied to the total system (A and B) or to subsystems (C and D). The subsystem approach focuses on specific programs of the total system and may yield more immediately usable results than the total systems approach considering the state of the science. But it does not provide guides to decisions concerning the allocation of resources among subsystems. The total systems approach provides allocation guides, but its complexity handicaps its practical application at this time.

Output Variables	Scope of Interaction Studied: Total system approach	Scope of Interaction Studied: Subsystem approach
Measured in terms of services provided	A	C
Measured in terms of educational effect on children	B	D

Figure 2. Applications of General Input-Output Model to Educational Problems

A system is a set of interrelated parts. The distinction between systems and subsystems is arbitrary. For the purposes of this paper, the "Total System" is the entire operation of what is typically known as a school district. If one's point of reference were the regional, state or federal levels, then our "Total System" would be but a subsystem. Subsystems may be variously defined within the total system depending upon the purpose of the analysis. Examples of possible subsystems are: the transportation system, the cafeteria system, the guidance program, the library system, the school, the classroom, a grade level, the mathematics program, the reading program, etc. "Program" in the context of PPB Systems and "subsystem" in the above context are synonomous. Defining the subsystems is part of the structural concern of PPBS and will not be treated here.

Subsystem Application

An application of the general input-output model to a subsystem (i.e. program function) in order to study the relative effectiveness of two alternative strategies is illustrated in Figure 3. Among the many programs in a school system this procedure focuses on one and studies specific alternative strategies for reaching the objectives set for the program. This application permits the estimation of the output effect which is likely to be caused by altering input controllable variables. Environmental determinants may be controlled through sample selection, analysis of covariance, or output residuals as previously described.

Such applications hold great promise of providing decision-makers with substantially more and relevant information concerning allocation alternatives for a given set of objectives than they have had heretofore. Frequently a school system attempts to meet a set of objectives (normally unstated) through a variety of programs (normally undefined). For example, within a given system, at a given grade level, for a given subject, it is not unusual to find a variety of organizational patterns (i.e. self-contained classroom, team teaching, departmentalization, etc.). By systematically reviewing the resource requirements and the results of each alternative, the relative effectiveness of each becomes more apparent. If the alternative which most nearly meets the desired objectives also requires the least in inputs, the decision is obvious. However, if the most desirable output is also the most expensive in its input requirements, the decision-makers must make value judgments concerning which will be to the system's advantage – high realization of objectives at high cost or a suboptimum realization of objectives at a lower cost. The decision-makers' task is normally further complicated by the fact that the alternatives are not consistent in their superiority (or inferiority) in meeting specific objectives within the set of objectives. Once again value judgments must be brought to bear. Cost-utility analysis does not make decisions. It only makes available and arranges data in such a fashion as to sharpen the judgments of the decision-makers.

Figure 4 illustrates a specific although hypothetical example adapted from Kershaw and McKean (Kershaw 1959). A school district has $150,000 in its budget for program improvement in its elementary self-contained classrooms. With this amount of money, it can raise teachers salaries 5% (presumably increasing the quality of teacher employed), or it may lower the pupil-teacher ratio by 8% (presumably increasing the amount of personal attention a teacher can give to each child). There are many other options, but for illustrative purposes

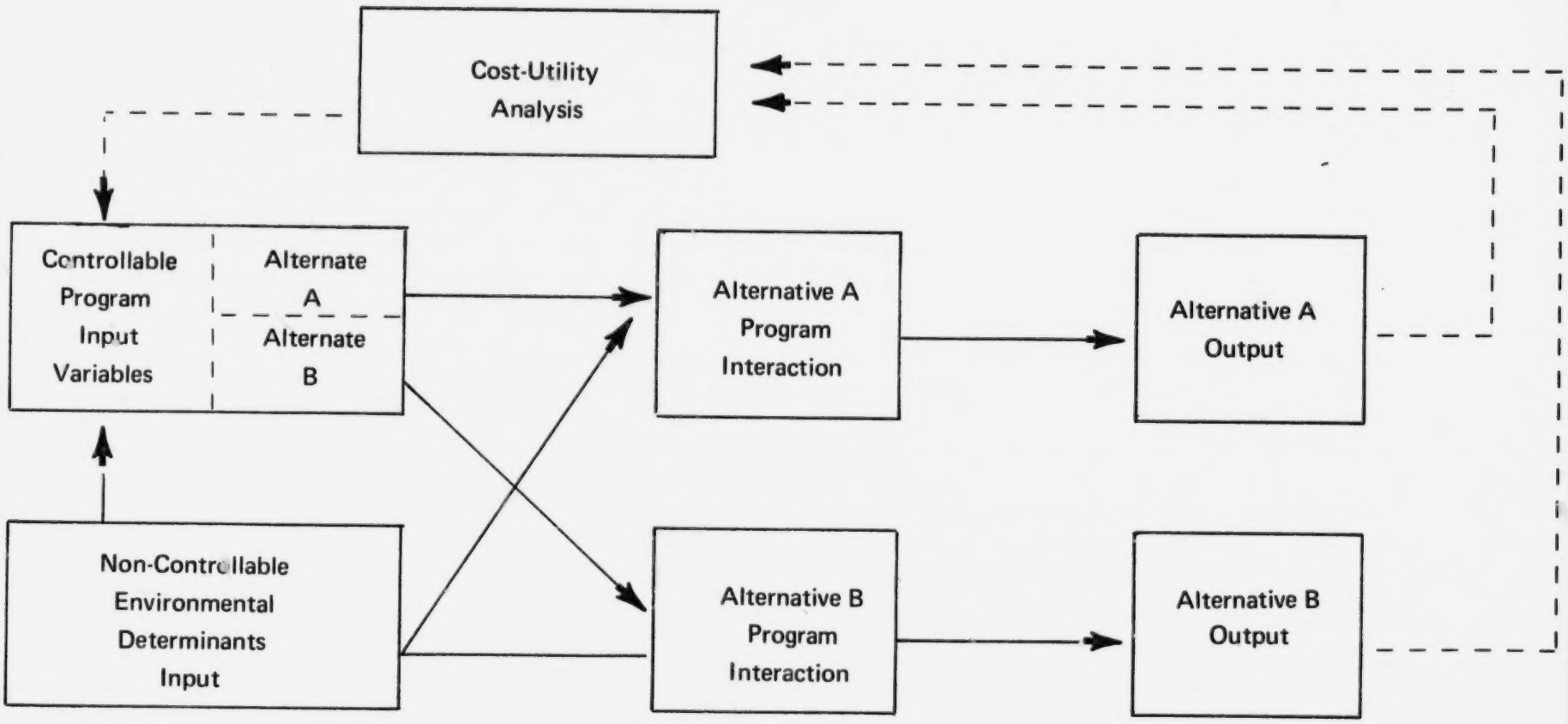

Figure 3. Use of Input-Output Subsystem Models in Comparing the Effectiveness of Two Allocation Alternatives.

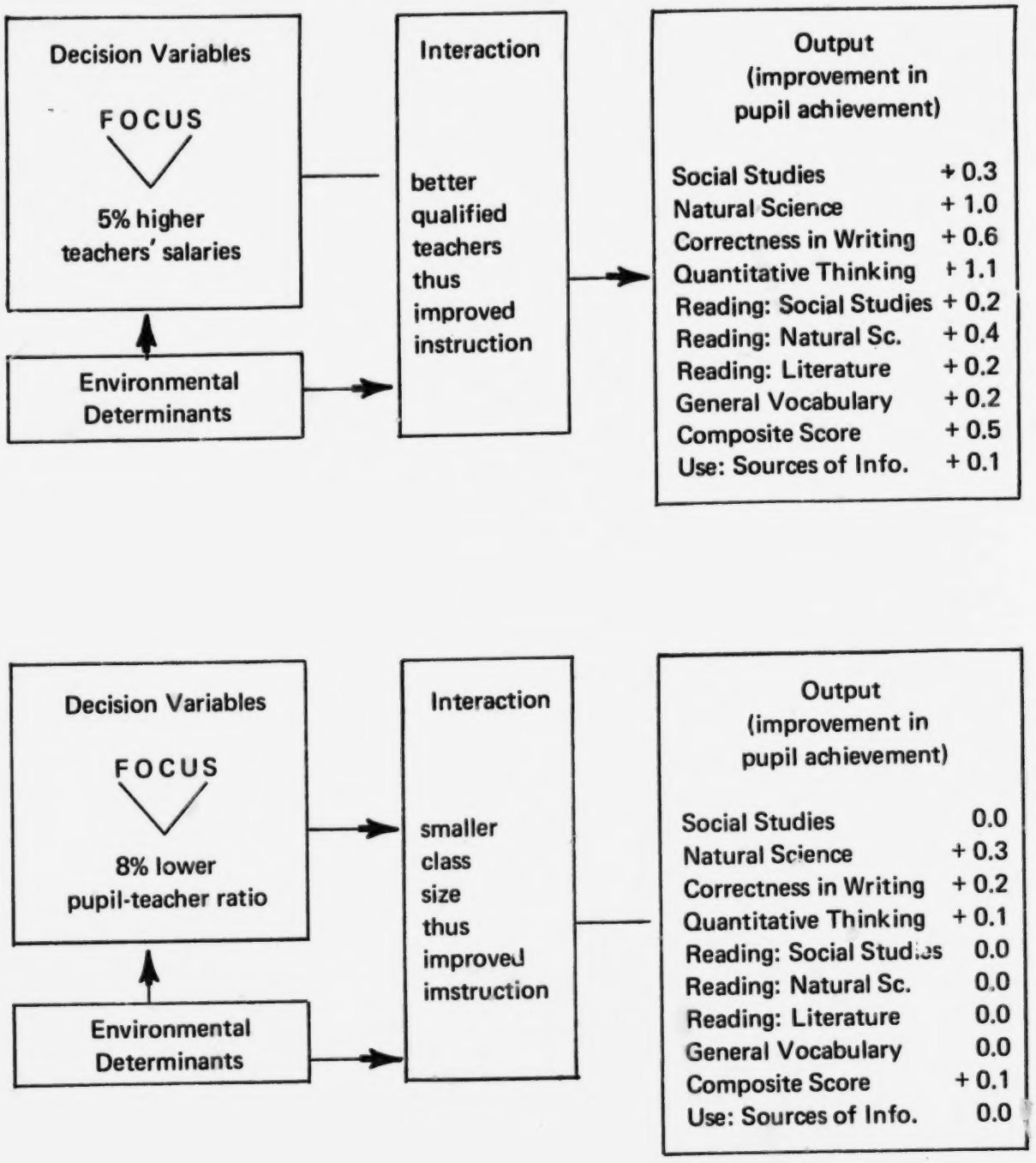

Figure 4. Application of General Input-Output Model to Two Alternatives for Improving Instruction in Self-contained Elementary Classrooms with Cost Increases Constant.

we will focus on the two. Which is the better choice? Figure 4 presents relevant information which should assist the decision-maker in arriving at his decision.

The output measures in Figure 4 are hypothetical, but it does not take too much imagination to envision them in the real world. Both alternatives require the same amount of resources. Both result in better pupil achievement, but the greater yield comes from increasing the salaries of the teachers. On the basis of the evidence presented, this is the wiser choice.

Cost-utility analysis is future oriented. In order to make projections into the future, it is necessary to have a good understanding of past and present relationships among variables. An adequate understanding of these interrelations in education does not exist. Early uses of cost-utility analysis in education of necessity must focus on studies of input requirements and output effectiveness of ongoing programs designed to meet similar objectives. Once a store of knowledge concerning these relationships is developed, it should be possible to sharpen the decisions made concerning new and untried directions in education. The object is to compare a system as it is with what it might be after one of several proposed changes has been introduced.

To begin to make progress in this direction the nature of educational data collected and its use must be substantially modified. Objectives of each subsystem (or program) must be clearly stated in measurable terms. Data must be collected which can show the degree to which the objectives are realized. Accounting procedures must permit the identifying of costs of a given program. Elements of these requirements probably exist in all school districts, but they are probably inadequate in all. Each school district should establish a department of planning, programming, budgeting systems. (If the district is not large enough to justify such expenditures, the district is too small and should be reorganized.)

Consistency in the use of analytical techniques is extremely important because of the focus on comparisons. Accuracy in the absolute sense is unobtainable. This is not necessary to determine the relative benefits of alternatives. To compare benefits of alternate interaction functions requires that alternatives be considered in an unbiased and consistent manner (Fisher 1967).

Actually, judgment or even intuition determines the course of action in most long-range planning problems. It is possible, however, through cost-utility analysis to array the available data in such a fashion as to sharpen the judgment or intuition of the decision-maker.

Optimizing the Combined Output of Subsystems

What has been said to this point concerns the collecting and arranging of data to better assist decision-makers in arriving at decisions among specific program alternatives. The allocation problem among programs remains. In choosing among alternative programs, the decision-maker is choosing among programs sharing common objectives. At the system level allocations must be made among programs, or subsystems, which while sharing some general umbrella objectives have different specific objectives. Occasionally the specific objectives

of one subsystem may be in conflict with those of another subsystem. In allocating resources to the total system it may be necessary to suboptimize some and perhaps all of the subsystems in order to optimize the functioning of the total system.

The problems of making an input-output analysis for the system are of the same kind as for the subsystem but of far greater magnitude. Output must be measured against the umbrella objectives of the entire system. The generalness of these objectives makes their measurement more difficult. The same holds for the measurement and control of Environmental Determinants.

Despite its complexity, the value to be gained from insights from applying input-output analyses compels us to apply research efforts in this direction. Figure 5 portrays the input-output model as applied to a school system. In the immediate future the only probable benefit is a better framework in which to view allocation problems. As researchers develop a better understanding of the interrelationships of variables, it may be possible to describe the allocation process by mathematical formulae which in turn would permit formal optimization techniques.

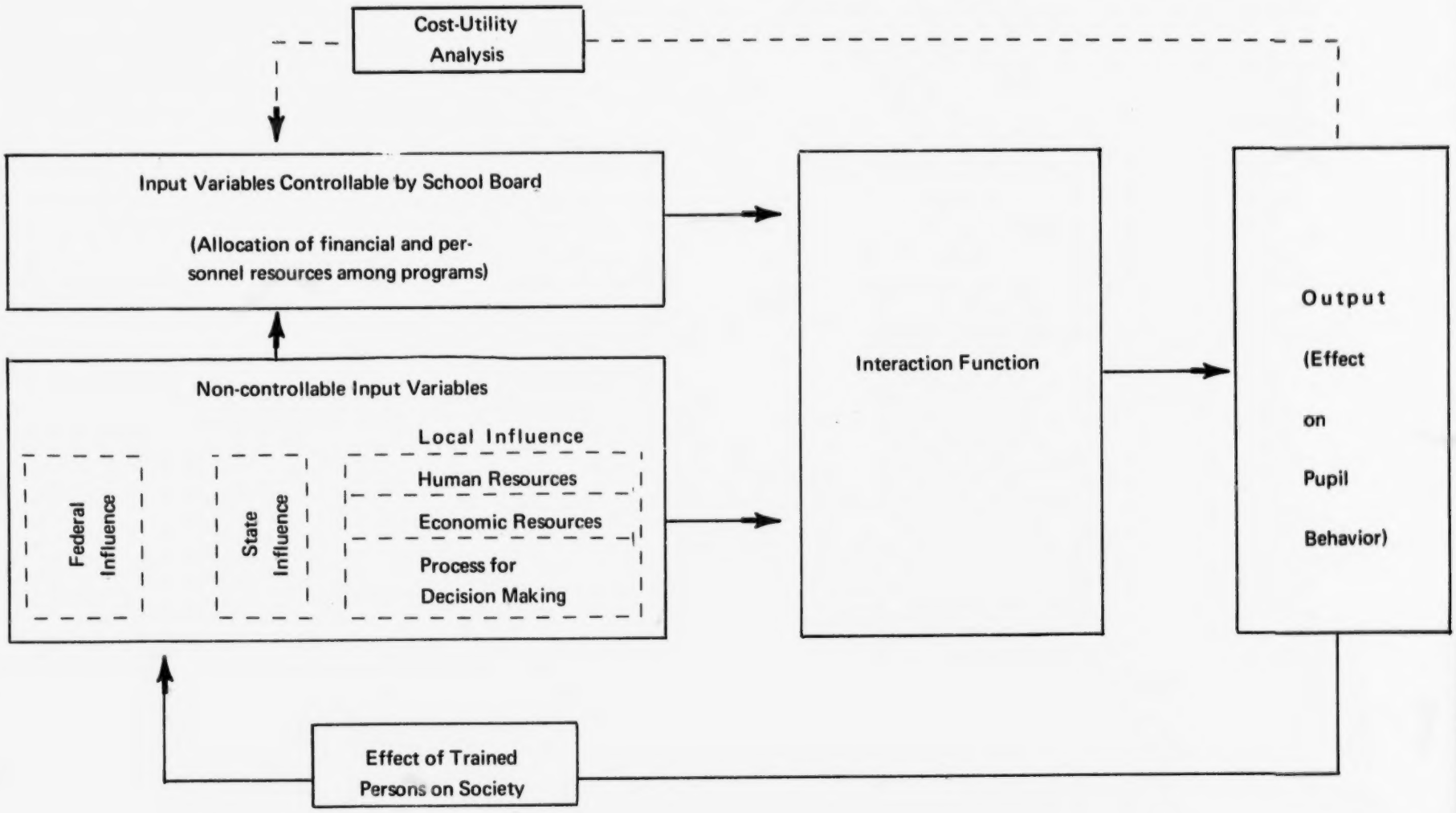

Figure 5. A School District Input-Output Model

Summary

1. Cost-utility analysis is the study of alternative means by which desired objectives (output) may be reached with a minimum application of resources (cost) or whereby desired objectives may most nearly be reached given a specific amount of resources.

2. Cost-utility analysis techniques may be used to study alternative courses of system-wide policy, however, given the present state of knowledge of the interrelation among variables, its application to subsystem allocation problems appears to have more immediate payoff.

3. Variables beyond the control of the decision-makers must be accounted for in cost-utility analyses of educational problems because of their very strong effect upon educational output.

4. Inputs affect outputs through an interaction function. This function is treated in a "black box" fashion in cost-utility analysis.

5. Cost-utility analysis does not make decisions. It arrays the data in such a fashion as to sharpen the judgment or intuition of decision-makers.

6. In order to provide better data to educational decision-makers: objectives must be clearly stated in measurable terms for each program; data must be collected which can show the degree to which the objectives are realized; accounting procedures must permit the identifying of costs of a given program.

7. The magnitude of the task of data collection and data analysis is such as to warrant the organization of a department of planning and development within each school system.

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EDUCATIONAL PLANNING, PROGRAMMING, AND BUDGETING: A SYSTEMS APPROACH

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Introduction

We live in a time in which movement of student revolt, Black Separatism, and public disaffection for educators are growing in popularity. The only constant in American social life is radical change itself.

In order to improve planning and offset the sense of powerlessness felt by school officials, more sophisticated policy-making tools have been developed and phased in to specific activities such as curriculum design, instructional media usage, pupil evaluation, facilities design, racial balancing, personnel management, and general long range planning. An increasing number of educators are making use of these sophisticated planning procedures that will help schools to exert control over their futures instead of merely reacting to the future and being controlled by it.

At the risk of over-simplification, it is apparent to many observers that education is on a threshold of a systems era. The systems approach, which is actually a composite of a number of planning, procedural and allocative strategies, has spread from industry and the federal government to local school districts. A question that confronts many school officials today is not whether systems analysis should be used in local schools, but how it can be used most effectively.

For this reason, the intent of this presentation is four-fold:

1. to outline the present limitations of the systems approach in local schools
2. to examine stages of budgetary reform in order to explain why program budgeting may replace the currently dominant incrementalism in local school planning
3. to portray some of the conceptual and operational elements of PPBS, and
4. to briefly describe several illustrative program budgeting installations of local schools.

Limitations of Systems Analysis in Education

As might be expected, most of the literature describing the new generation of interrelated management processes is rather long on persuasion and short on critical appraisal. The net result is that educators often do not have sufficient information with which to judge the relative worth of competing systems techniques.

So what I would like to do first is to consider some of the limitations of systems procedures

in the context of education, and thereby reduce the gap between the expectations and achievements that you may have. This focus on shortcomings which is offered by one who is strongly committed to the systems approach should not be interpreted as a rejection of these emergent techniques, but rather as a call for even wider usage of systems analysis in schools after educators and the public have a more realistic understanding of the benefits to be gained.

The twenty-five limitations of which I am about to discuss may fall under three major classifications:

Conceptual Limitations (problems of theoretical definition)
Operational Limitations (problems of administration execution)
Societal Limitations (problems of environmental relevance)

However, I will not attempt to identify each specific limitation according to one of these categories because in some cases they may fit all three classifications. These twenty-five limitations of systems analysis, as noted in Table I, are as follows:

TABLE I

25 LIMITATIONS OF SYSTEMS ANALYSIS IN EDUCATION

1. Confusion Over Terminology
2. Problems in Adapting Models
3. A Wisdom Lag
4. Illusions of Adequacy by Model-Builders
5. Inadequate Impetus from States
6. Centralizing Bias
7. Unanticipated Increased Costs
8. Goal Distortion
9. Measuring the Unmeasurable
10. Cult of Testing
11. Cult of Efficiency
12. Spread of Institutional Racism
13. Political Barriers
14. Conventional Collective Negotiations Procedures
15. Lack of Orderliness for Data Processing
16. Monumental Computer Errors
17. Shortage of Trained Personnel
18. Invasion of Individual Privacy
19. Organizational Strains
20. Resistance to Planned Change
21. Antiquated Legislation
22. Doomed to Success
23. Imagery Problems
24. Defects in Analysis
25. Accelerating Rate of Social Change

The first limitation is **Confusion over Terminology**[5]. The term systems analysis, if you ask someone to define it, has almost as many definitions as it has people using it. This is unfortunate. One indication of the confusion that surrounds this topic is the fact that there are at least sixty different code names and acronyms for systems approaches such as: systems analysis, operations research, operations analysis, PERT, PPBS, Program Budgeting, Cost Effectiveness Analysis, input-output analysis, Cost Benefit Analysis, C.A.I., modular scheduling, etc. which makes it rather confusing.

Systems Analysis is more than computer-based techniques. It subsumes an outlook or a mode of thinking by which a particular organization may be defined as "a number of identifiable, interdependent, integrated parts." - known as the "system". "Analysis" simply provides glimpses of the operations of the parts of the system. Now, analysis may utilize the computer, but you don't have to define it as only computer based.

The Second Limitation I have is the **Problems in Adapting Models**. Generic models must be altered to fit specific situations because when you develop a model or procedure in one context such as industry or the military, it may not be transferable to another context such as education. We must be aware of inherent loses in the adaptation process.

Third is the **Wisdom Lag** that exists. The quantum jump of technology and science far transcends any comparable advance in human wisdom. A wisdom lag is apparent. We can analyze intricate educational problems with computers but often times we cannot estimate the value and relevance of data. The tragedy of our era is that human intellectual capacity as addressed the problems of human relationships seems if anything regressive. This relates to the question of "How do you ask questions of the system once it is installed?" We know how to analyze but judging the relevance of data is the key problem.

Fourth is the **Illusions of Adequacy by Model-Builders**. Too strong confidence in mathematical models of schools may bring a condition into which far from adequate models are taken too seriously for want of better models which remain tactical. I think operation researchers in particular suffer from what I call illusions of adequacy, but because they have highly sophisticated quantitative procedures and they are able to model educational systems, they may not be adding much value to school administrators. The elaborate analysis may be based upon poor data or questionable premises under which these people operate.

Fifth, there has been **Inadequate Impetus from the States** for the support of systems procedures. And I don't think that systems analysis is going to be adapted in any of the smaller school districts until state departments of education increase their support for this topic. It is my opinion that individual states will not increase their support until at least six conditions are met:

1. Existing experimental projects that occupy higher position of priority from the state's perspective, are completed.
2. Regional data processing centers are established on a time-sharing basis.
3. Mandatory consolidation eliminates the total number of school districts in a number of states.
4. The advantages of systems procedures to local schools must be specified in a convincing manner to show that we are not simply equating something new with something better. We have to demonstrate that the new procedures are, in fact, better than existing planning procedures.
5. Pilot programs must be designed and conducted taking different types of districts in different areas of the state, defining programs in different ways by

using various systems procedures so that we can show that it is a flexible approach.

6. The U.S. Office of Education demonstrates that its involvement with operations analysis is a success. As you know the U.S. Office of Education is on a program of adoption of operations analysis procedures.

The Sixth Limitation is **Centralizing Bias.** As many local districts have grown and increased their complexities with data banks, information centers, and other computerized devices, decision-making has become much more centralized within a tightly defined chain of command. The distance between the "leader" and the "led" has been increased, thus reducing the individual's democratic rights of decision, dissent, and deviation. How to balance the advantages of efficiency obtained from centralized decision-making against the human survival values of individual decision-making at the point of stress is a basic problem of public governance in our time. Educational data processing has a Centralizing Bias at the very time when the public is demanding decentralization of public education.

Another limitation is **Unanticipated Increased Costs.** New systems procedures, including PPBS are not designed to reduce spending per se. Program budgeting, for example, is neutral on the issue of cost reduction. In fact, it may actually accelerate school costs because of requirements for additional personal, additional equipment, and additional material. There is nothing inherent in program budgeting to enable it to avoid at least one pitfall of conventional function-object school budgets and that is "worse than the last but not as bad as the next." Look at your own budget and put it in that place - "worse than last year's but nowhere as bad as next year's." The basic advantage of PPBS lies in its attempt to shift the budgetary focus from objects to be bought to programs to be accomplished. There is a very subtle distinction between what is a program budget and what is a function-object budget. One emphasizes what things you have to buy and the other one emphasizes programs you would like to accomplish. But the limitation is that this may, in fact, increase your costs. You will be allocating your resources more efficiently but with personnel costs rising at an increasing rate, your over-all budget is going to increase also.

Another limitation is the notion of **Goal Distortion.** Systems analysts should not suggest that the entire output of an educational organization can be quantified and measured. Unfortunately, there is a tendency in organizations to place greater emphasis on those goals that are most easily measured and to neglect the goals that you can't measure quantitatively. For example, cognitive mastery - we tend to place greater emphasis on this because it lends itself to measurement even though it may not be the most important goal within the schools. This is called goal distortion - that the organization tends to seek only those goals that it can measure. System analysis enhances the possibility that goal distortion will take place.

Measuring the Unmeasurable is another limitation. The matching of educational program objectives and performance measures is much more complex than some systems analysts appear to believe. In a decentralized, open system, and this is what a school is, generally, objectives are usually matters of rather rigorous public debate. There is remarkably little unanimity regarding objectives and effective ways to attain and measure them. We may be

trying to measure the unmeasurable. Presently, I think that systems procedures and some of the mathematical instruments that we have are much more elaborate than our educational measurement criteria, and performance indicators are what is needed.

Another danger of systems analysis in education relates to a **Cult of Testing**. Standardized tests of academic achievement have long been used as indicators of systems performance, although they have probably created more problems than they have resolved. I think there is a real danger that what we may create is a cult of testing. Testing that is based upon poor instruments, disputable assumptions, incorrectly interpreted data, and purposely manipulated data can offset the advantages afforded by systems procedures. Organizing education in terms of the economic theory of input and output is dangerous at a time when our evaluation methods are so primitive. It tends to minimize those significant school activities especially in the affective, moral, aesthetic realm that do not lend themselves to the crude instruments now available for testing. It is easier to assert that anything which can be described can be quantified than it is to develop acceptable measures.

We may also establish a **Cult of Efficiency** through the use of systems analysis in education. Systems analysis may place too much emphasis upon economic savings resulting in preferances given to saving at the expense of accomplishing. Critics of economic policy point to current urban wastelands as examples of how humane concerns often give way to economic efficiency with rather disastrous results. The need exists today for occasional uneconomic allocation of resources, and in this way the schools can benefit from resources being wasted "on non-economic values that mirror our social conscience." If we try to use only economic efficiency measures, we are going to go right down the road of city wastelands that we already have. We need uneconomic allocations.

Another limitation of systems procedures is that it may encourage the **Spread of Institutional Racism**. Because systems analysis is a means, rather than an end in itself, it may be used to perpetuate the subtle institutional racism that threatens to divide this nation permanently. Violent black-white confrontation will increase in intensity if our planning strategists do not actively seek to destroy the seeds of both institutional and private racism. Tactics of dissent can lead to strategies of reform but the success of systems strategy is depended ultimately upon the social conscience and the talent of their proponents.

Political Barriers! Schools are not politically unencumbered. Because public education is public policy, the schools are directly responsive to political elements that may serve as road blocks to systems procedures. The politics of education, as a field of study, is still in its formative stage. The introduction of systems procedures, for example program budgeting, may cause school officials to choose political feasibility in preference to economic desirability. The budgetary process takes place in the political arena, and many persons may not wish to expose their values and make visible in the program budget some of the items that can be somewhat camouflaged at present. Even though education is amenable to some amount of systems analysis, members of the power structure may view economic rationality as an infringement upon their domain.

Another limitation pertains to **Conventional Collective Negotiations Procedures** – maybe

the most important limitation of all. Teachers negotiations and the inherent struggle for economic political power may place a great limitation upon the use of systems analysis in education. Each year since 1965 has brought a record number of teacher strikes in this country and no end is in sight. In spite of new systematic approaches to resource allocations, collective negotiations for the immediate future and maybe the long term future will continue to be based upon the conventional function-object type of budget. This condition will also exist in those institutions which claim to be using program budgeting and other systems concepts. What I am saying in effect is that you as an administrator may have fun with your systems gimmicks and you develop a program budget or some of the other approaches, but it may not be a tool with which you are able to make the basic decisions within the district. It may be interesting, but irrelevant because of negotiations which will consume more and more of your time and your staff's time and will continue to be based on the old line item conventional approach to resource allocations.

Another limitation is the **Lack of Orderliness for Data Processing.** The primary difficulty in adapting an information storage and retrival model in educational administration or in the behavioral sciences, generally, is one of orderliness of content. Information retrival usually implies organized information so that discrete data may be easily located. Educational administration presently lacks a comprehensive theory, and thus it also lacks the orderliness of a uniform scheme for classification, storage, and retrival of information. A taxonomy, or an extensive classification scheme, should serve as a point of departure so that data bases can be developed.

A limitation within the operational area of systems analysis would be **Monumental Computer Errors.** Computers have been represented as infallible, impartial, and indispensable machines. At times they have been over sold by their zealous proponents. There is increasing evidence that computers may be erratic and easily made inoperative in some cases by simply a speck of dust. A newly developed business, for example, is one that provides insurance against computer-inflicted disasters. Because of the speed of computations even normally trivial mistakes which can be blamed on human programers become monumental when they are placed onto punch cards. In short, when data processing errors occur they can be extremely costly and difficult to remedy. In addition to the error factor, additional long range costs may be incurred because of the high obsolescent rate of computer hardware.

Shortage of Trained Personnel is another limitation. Local schools generally have inadequate staffs for systems planning. This problem is compounded by the fact that many districts do not have the financial resources that might be needed for a full scale installation. Deficiencies exist in the training programs of school administrators, the usage and number of administrative personnel, and the usage of electronic data processing. The result is that a number of school districts, particularly in large cities, have been deliberately opportunistic in their approach to systems development rather than systematic and comprehensive. They have phased in specific systems elements without installing comprehensive procedures. The focus of these districts, I think, is upon those sectors of high apparent yield and not upon a full scale installation of PPBS. For example, many districts will install a program budget without installing a planning, programming, budgeting system.

Another limitation is the **Invasion of Individual Privacy** that is inherent. Unless there is some sort of model regulatory code, the computer could endanger individual privacy rights. If life long computer knows the answer could be used, then a comprehensive set of rules on information gathering, disclosures, and confidentiality should be enacted. Otherwise computers could turn schools and society into a transparent world in which every indiscretion of an individual could be evaluated by others. Similar arguments at the national level have been put forth in an attempt to stop the development of a national data center. There is disagreement over whether or not this proposed national data center should be a purely statistical data gathering bank or an intelligence center. As a result it has not gotten approval as yet. The invasion of individual privacy is a crucial element and can cause a lot of resistance to the use of these procedures.

Organizational Strains. Systems procedures tend to put organizational dynamics into the spotlight and this may create conflicts and pressures. With the introduction of concepts such as PPBS, it can be anticipated that there will not be a disappearance of bureaucratic inertia, vested interests, old prides, honest differences of opinion, and political activities among the members of your staff. In fact, such procedures may initially serve to accentuate conflicts and engender antagonisms as the school's objectives are exposed in "cold, analytical terms". You're making visible your values as a school district and in so doing you probably are going to encounter even more resistance to some of your professed values. Measuring school performance quantitatively may irritate those who are value oriented, emotionally oriented, politically oriented, or who just don't understand what it is you're trying to accomplish.

This leads to another limitation which is the **Resistance to Planned Change.** It is possible that some of the new systems procedures may encounter opposition from classroom teachers who view operations analysis or systems analysis as an encroachment upon their professional activities. Impersonal efficiency measures may be incompatable with the human subtleties of education. Opposition of some degree to any kind of planned change or innovation exists in education. An in the case of systems analysis, some teachers may resist the new procedures not because they are stubborn but because their pride causes them to be fearful of failing at something new. The terminology that surrounds this concept may tend to put a lot of fear in classroom teachers who otherwise would be most supportive of your proposals.

Another limitation is **Antiquated Legislation.** Legislative appropriations for education continue to be made on an objective expenditure basis rather than on a program basis, with some exceptions. This tends to restrict the extent to which programatic priorities can be determined with analytical tools. It also tends to perpetuate meaningless truisms and cliches such as "meet the needs". A completely useless term that we use frequently to describe what we are doing. A well-informed political representative of the future will no longer be content to know in mere dollar terms what constitutes the abstract needs of the school. He will be unimpressed with continuing requests for more input without some concurrent explanation of the school's output.

Another limitation, directed at superintendents in particular, is **Doomed to Success.** It is likely that some systems procedures will be "doomed to success" in local schools. The reason is that the evaluation of an innovative technique may be conducted by the very same persons who originally installed the device. It is unlikely that such officials will claim that their modern technology is anything less than a "smashing success". The success of a number of systems concepts has never really been measured. Instead most of the descriptive literature pertains to the potential value of the new concepts but does not validate them.

Imagery Problems! The value of new approaches will depend in large part upon their acceptance. A serious impediment to an early achievement of large-spread approval could be the sophistication of the image that is imparted to systems analysis. The image of systems procedures may include a belief that they can be operational only with a staff of highly specialized systems experts backed by an extensive computer installation. Such misconceptions arise because many of the systems procedures are used primarily in large city school systems and in government agencies that possess such facilities and trained personnel. Don't be overcome by some of this image that has been attached to systems procedures. It is more a way of thinking than it is simply an accumulation of hardware.

Defects in Analysis is another limitation. It is admitted by the specialists engaged in systems analyses that every systems analysis has defects. Some of these are limitations that are inherent in all analyses of choice. Others are a consequence of the difficulties and complexities of the particular question or issue. Still others are blunders or errors in thinking which hopefully will disappear as more people do better and more complete analyses. The human mind possesses what has been called "a rage for order". It means that man may attempt to impose order on what are simply random events. If we interpret random events as non-random, our analysis is likely to be defective and produce no predictive value.

Another limitation, alluded to earlier, is the **Accelerating Rate of Social Change**. Some cynics claim that "the future has become a thing of the past". They seem to be indicating that the increasing rate of social change makes long range planning impossible. Others claim that a modern social system, such as a school, is actually not a system. Actually modern social systems are a type of conflict system, and they may be explained by means of numerous models developed in the areas of national security research and peace research. There is concern of whether or not one can adequately use the method of systems analysis to examine social problems. Particularly in a city context. The conditions change so fast and many of these are so unpredictable that one really has difficulty putting them in this frame of reference.

It is easy to exaggerate the extent to which the sixty or more systems concepts can assist educators. The purpose of this first section was to identify a number of current shortcomings in the methodology of systems analysis. It should be emphasized that systems procedures are a means, not an end, for achieving educational equality and excellence.

These limitations, however, are far outweighed by the potential advantages to be gained. It is probable that many of the present limitations can be overcome as more of you apply your talents to this topic. In the final analysis, the success of the whole systems movement de-

pends upon the artistry of the user.

Budget Reforms and Current Incrementalism

Now I would like to move into the PPBS area and address myself to three or four questions, for example: What kinds of budget reform have taken place in education? What is PPBS? Where is PPBS presently being used? What kinds of program structures are possible?[1]

The basic distinction between the program budget and the conventional budget, once again, is that the conventional budget emphasizes what is to be bought, while the program budget emphasizes what is to be accomplished.

Traditionally, the local budget has been used as a device for providing two things – first, a strong fiscal accountability and managerial control accountability to the public for its funds and secondly, control between and within the governmental agencies responsible for the expenditures and appropriation.

The budget that is used by the local schools in Michigan and other states evolved as a consequence of the general governmental reform movement for the past fifty years or so. It is not surprising that the distinct stages of educational budget reform are nearly parallel to those of the national budget reform in the United States.

Table II essentially shows two things – the stages the federal budget has gone through since 1920 and the influence of this upon the educational budget. It is interesting to note that the first federal budget in the United States was not developed until 1922, and its purpose was to control administrative abuses. It was really developed as a way of putting a check on the administrator, and thus from 1920-1935 it had a control orientation with the budgetary intent being central control of spending.

The second orientation of the federal government budget reform, occurring from 1936-1965, was management. The primary usage of the budget during this period was to assess work efficiency and to emphasize performance measurement. This is related to the scientific management era when Taylor's concepts flourished and time and motion studies in industry were prevalent.

This led us into the third budget stage of the federal government which is the planning orientation stage. Herein the budget itself is used for policy formulation, to extend time horizon, and to emphasize programmatic outcomes. The budget itself becomes a planning document for determining the course of action for an organization, in this case the federal government. The reason for the beginning date of 1966 for this stage is that this was the approximate time when the federal government installed PPBS. It is because of the influence of Mr. McNamara and the Department of Defense and the subsequent success of PPBS in a number of other government agencies such as the Department of Agriculture that the entire federal government by Presidential Directive signed in 1965 adopted and phased in the Planning, Programming, Budgeting System.

TABLE II

COMPARISON OF THE STAGES OF BUDGETARY REFORM IN THE FEDERAL GOVERNMENT OF THE UNITED STATES WITH THE DOMINANT ADMINISTRATIVE DOCTRINES AND BUDGET FORMATS USED BY LOCAL SCHOOL DISTRICTS

Federal Government Budget Reform			Local School Administration – Budget Reform			
Major Orientation	Approximate Period	Budgetary Intent	Dominant Doctrine of Administration	Approximate Period	Budget Format	Budgetary Intent
			1. Teaching teachers	1870–1875	Underdeveloped	N/A
Control	1920–1935	Central control of spending; Prevent administrative abuses	2. Applied Philosophy	1886–1905	Nonstandardized	N/A
			3. Business Management	1906–1935	Object-of-expense	Fiscal accountability Focus upon things purchased
Management	1936–1965	Assess work efficiency; Emphasize performance measurement	4. Technical Expertise	1936–1950	Function-object	Apply industrial management concepts to school finance; provide broad functional categories; unit cost analyses
			5. Administrative Science	1951–1967	"	"
Planning	1966	Use budget for policy formulation; Teletic; Extend time horizon; Emphasize programmatic outcomes	6. Systems Analysis	1968	Program	Focus upon instructional programs and objectives; long-range emphasis; specify assumptions; explicit evaluative criteria

Now, looking at local school administration budget reform we can note within approximate periods of time the dominant doctrine of administration, the budget format, and the budget intent.

As Table II shows, when the superintendency was initially developed the dominant doctrine was one of **Master Pedagogue** – a teacher of teachers. During this period of 1870-1885 there really wasn't any developed budget format and obviously was not applicable in terms of budgetary intent.

From the period of 1886-1905, the superintendent became more an **Applied Philosopher** who determined the "ideal" curriculum, the functions of education, and the moral perspectives that students should attain. This period saw a nonstandardized budget format.

The third stage may be called a business management era where the primary function of a chief school officer seemed to be to manage a business-like enterprise which can be tied into some of the influence of scientific management. The term, **School Executive** was used more widely during this period. The budget developed then was accentually an object-of-expenditure budget which simply listed and identified budget items according to some prescribed state code. The primary intent of this budget was fiscal accountability focusing upon things purchased.

The dominant doctrine of school administration from approximately 1936 to 1950 was one of **Technical Expertise.** Administrators during this period tended to be identified as technical experts or specialists in plant planning, site selection, curriculum, or personnel, for example. During this time a function-object type of budget was developed where in addition to just listing objects they tried to also list some of the functions that their school expenditures were being used for. This is probably the type of budget that most school systems use now in the State of Michigan. Here the budgetary intent was to apply the industrial management concepts to school finance, provide broad functional categories, and attempt to develop unit cost analyses.

Then we moved into an era of the **Administrative Scientist** during the early 1950's continuing to approximately 1967. Again the type of budget was the "function-object" and the budgetary intent was much like that of the "Technical Expertise" era.

I am suggesting that we are now entering the era where the administrator may be viewed as a **Systems Analyst**. We speak of a school "system"; we utilize much of the literature of social systems, cultural systems, political systems, economic systems, and psychological systems to analyze a school. If you look at the journals you are reading and the consultants you are relying upon whether it be in learning, student achievement, organizational climate, political decision-making process, or the way you allocate resources, what you are doing is bringing much of the literature of these other system sciences into application in an educational context. I, therefore, suggest that this year might be designated as the starting point

for moving into a program emphasis in allocating resources wherein the focus is upon instructional programs, objectives and long-range emphasis, specifying assumptions under which we operate, and establishing explicit evaluative criteria.

This is done to point out where we are in comparison to where we have been. In no way do I suggest that we should abandon what has preceded us. I have never suggested that we should abolish the function-object budget. I think it would be helpful for school districts to retain both. The function-object budget reports the "inputs". What do you need in your school to accomplish something? You need teachers, administrators, transportation, debt service, etc. – That's your function-object budget.

But, what are the ouputs of your school? What are the programmatic, desired outcomes? The output budget is your program budget. You'll have the same total, but you simply will report your total in two different ways – on an "input" basis and on an "output" basis. Reporting on the "output" basis (program budgeting) need not be done monthly. Perhaps what you would have would be a program budget for the year and for a projected five year period. It would probably be only at the annual session on budgets where you would really deal intensely with program decisions by the Board of Education. For control purposes throughout the year you would use the function-object budget.

PPBS: CONCEPTUAL AND OPERATIONAL ELEMENTS

PPBS is part of the new generation of interrelated managment procedures which seek to enhance organizational rationality. The extension of the time horizon in educational planning with the program budget is a way of attempting somewhat to control the future instead of merely reacting to it and being controlled by it. The conceptually distinct elements of planning, programming, and budgeting constitute the process by which objectives and resources, and the interrelations among them, are taken into account to achieve a coherent and comprehensive program of action for an organization as a whole.[2] An essential operational characteristic of PPBS is the projection of total resource and dollar needs for a suitable number of years and in relation to key decision variables of the organization.

Characteristics and Advantages of PPBS: Twenty Theses

The twenty theses[3] which follow are aimed at describing, in outline form, the concept of program budgeting (PB) as it should operate in local educational planning.

1. **Output Emphasis.** The budget is structured on the basis of outputs, missions, functions, activities, services, or programs, rather than on conventional input items. A program is related to operational objectives, and consists of activities to be performed, sub-programs, and program elements such as human resources, materials, space and facilities.

2. **Input-output coordination.** PB seeks to relate inputs to the programs of an organization in a way which enhances a rational means-ends calculus.

3. **Evaluation.** Comparison of desired outcomes, as expressed in programmatic objectives, may be made with actual accomplishments. Performance indicators are utilized, such as indices which measure changes in pupil cognitive development.

4. **Long-range fiscal planning.** The annual budget is integrated with multi-year projections on a continuing basis. Typically, a program budget document portrays estimates of needs and costs over a time horizon of at least five years. Annual planning calendars and cycles are constructed.

5. **Quantitative analysis.** In order to analyze comparative benefits, quantitative measures are applied if they are available. These include such techniques as: input-output analysis, benefit-cost analysis, cost-effectiveness evaluation, operations analysis, management information systems, linear programming, simulation, queing, gaming and others. Qualitative measures are also included and they should play a major role in educational planning.

6. **Multiplicity of options.** PB provides a framework for the consideration of all relevant alternatives for a particular course of action. These are then placed in order on the basis of desirability, feasibility, least cost, available resources, and other criteria.

7. **Programming.** Lines of action are drawn to coordinate the planned objectives, programs and activities, and costs along an extended time dimension.

8. **Program review and revision.** In addition to program formulation and analysis, procedures for periodic review and modifications of programs are specified. This process is dynamic, viable, and promotes the adoption of innovations. Intra-program studies are encouraged.

9. **Subprograms and Program Elements.** Each of the major programs contains delineated sub-programs which minimize overlapping. Supporting program elements for each are specified.

10. **Future needs.** More explicit assumptions can be made about future demand and production functions of the organization. Risk is reduced and assumptions are specified. Total cost implications of long-term undertakings are expressed.

11. **Economic rationality.** There are at least two schools of budgetary theory, one subscribing to economic rationality and the other to political rationality. PB is essentially an economic concept designed to serve in the political arena. It represents an encroachment of economics upon politics, and is an embodiment of classical political economy.

12. **Flexibility.** PB does not impose arbitrary constraints. Programs can be defined in any way suitable to a particular organization. This approach is suitable both for internal programming and control and for development of future policies

and programs.

13. **Openendedness.** Expenditure items are not treated as givens. The amount available for the total system is determined and the highest utility alternatives are selected for the specified budget programs. The major objective is not expenditure control in the fiduciary sense.

14. **Policy determination.** Budgeting becomes an integral part of the administrative process with PPBS. The financial administrator shares in policy formulation, and provisions should be made for a continuing dialogue among the policy maker, systems analyst, budget officer, and the organization members affected by such policy.

15. **Decision centers.** Within some organizations using PPBS, decision centers and cost centers are developed so that administrators can have at their fingertips historical and projected information from all phases of activity. These are retrievable from a computer data bank. Simulators of the budget can be developed.

16. **Cost neutrality.** PB is neutral on the issue of cost reduction. A cult of efficiency, measured by less spending, per se, is not the criterion of success for PPBS.

17. **Structural variability.** Organizational structural variability is maintained, because the operations may be either centralized or decentralized. If the latter, participatory planning is encouraged so that policy making is shared by all members of the organization. If the former, lowest departmental level budget estimates form the building blocks for the next level where they are aggregated, reviewed, and transmitted upward to the highest level.

18. **Accountability and performance measurement.** PB can be used for control and internal management purposes to review personnel data, output data and resource data. It seeks to measure performance and affix accountability. Cost accounting procedures are generally a part of the PB format, although it may be necessary to redesign an existing accounting system so that it will provide information to meet line-item, legal accounting requirements, and also provide data on program costs.

19. **Concise budget document.** The actual PB document should be concise, but complete, and should be understandable even to a lay reader. Local school budgets frequently use terminology and non-programmatic categories which are too technical and unclear for their citizenry. With PPBS, the programs should be clearly stated so that the public can grasp their contents easily.

20. **Preservation of the past.** The program budget encompasses the best features of previous budgeting formats; the executive budget; line-item, object budgets; and performance budgeting. It need **not** replace conventional budgeting procedures. For the time being, line-item **and** program budgets probably should be main-

tained concurrently as a means of describing an organization's expenditures on both input and output basis.

Program budgeting is not a panacea. It does not abolish the vulgarity of concern over dollars, nor does it ensure that this ideal-type blueprint will be maintained successfully in actual practice. The "original sin" in the world of school finance is not budgeting, but comprises numerous intervening variables which existed long before the program budget: human errors, poor judgement, dishonesty, resistance to accountability, administrative shortsightedness, adherence to orthodoxy, manifest political factors, and the like.

EXEMPLARY PROGRAM BUDGETING INSTALLATIONS IN LOCAL SCHOOLS

The range of projects which are designed to develop PPBS encompasses the United States Government, industry, state and municipal governments, higher education, and local school systems. For these diverse organizations, the common aim is to chart the direction of future events less in response to impulse than to reasoned strategy. Although program budgeting is still in a formative stage in education, a small number of urban school districts claim to be phasing-in at least several aspects of a program budget format. Close observation of their procedures reveals that some have simply continued their conventional planning and budgeting approaches, but under the disguised name of program budgeting.

Perhaps the most common misuse of PPBS by school districts is to assume that the concept applies only to a school's fiscal operations. Most districts which claim that they are moving towards a PPBS design apparently do not involve curriculum-instructional specialists until a later phase, if they are involved at all. If this new approach is to be successful, it is imperative that instructional specialists be involved from the very inception in the design of the program structure and classification of the program components. Progress has been impeded by the newness of the concept, the lack of familiarity of most school officials with recently developed management science techniques, perennial resistance to innovation which plagues education, and insufficient venture capital to engage in research and development projects of any kind.

Representative Local School Districts

Among the urban districts which purport to be using program budgeting are: Baltimore, Chicago, Dade County (Miami, Florida), Los Angeles, Memphis, New York City, Philadelphia, Sacramento, Seattle, and an intermediate district in Westchester County, New York. Detailed information for each project is generally available upon request. In my judgement, three of the most interesting and noteworthy projects are those of Dade County, New York City, and Sacramento.

1. **Dade County Public Schools.** In early 1968, the District announced that it received approval for a Title IV (E.S.E.A.) research proposal for the three-year, $600,000 comprehensive project in program budgeting. Although this project may have a national impact upon schools which are seeking directional assistance, it is likely to take several years until definitive guidelines and technical manuals are prepared by Dade County and made available to interested outside parties.

A unique feature of this project is that it is sponsored jointly by the District and the nation-wide Association of School Business Officials (ASBO), the latter organization serving as the dissemination agent for this venture.

The District developed a comprehensive program called a "Strategy of Teaching", which pertained to the overall improvement of its instructional program. One part of this project involved the design and implementation of a management system capable of providing support to the teacher in specified ways. Teacher support was organized into three major efforts:

a. **Instructional Services.** This category includes research developing and pilot testing experimental, instructional programs, evaluation of results, and massive in-service training for personnel to acquaint them with the "Strategy of Teaching".

b. **Administrative Services.** Included are services related to personnel, procurement, finance, planning, data processing, management reports and others.

c. **Operational Services.** This category contains physical services needed by teachers, such as building and capital outlay programs, maintenance, operations and custodial services, transportation and others.

Each of these service areas was described in greater detail by the District. For example, one objective for Administrative Services was the development of a five-year operating plan with a program budget in which all costs of the schools would be identified in three distinct ways: by object class; by responsibility, and by program. In addition, PERT networks were prepared and a data bank designed as a means of providing school officials with reports by which they could better evaluate the qualitative and cost performance of various programs. A management training course was developed to introduce personnel of all administrative levels, from assistant principal upwards, to the new format. Efforts were directed towards the development of a series of procedural manuals in the areas of overall system design, cost systems, program identification, accounting procedures, program budgeting, evaluation, electronic data processing, and others. Included in the original program budget research proposal was Table III, which serves as a model of conciseness in summarizing projects. The areas of research, or functions, are listed across the top of the table, and beneath each area is a summary of 1) objectives, 2) procedures, and 3) the products of research which the "Strategy for Teaching" project is intended to yield.

The Dade County project appears to be quite promising, but early results will probably not be available until at least 1970.

2. **New York City Public Schools.** In early 1967, the City of New York Board of Education announced first-phase plans for the development of a comprehensive PPBS, promising that ". . .this will be the first such installation in a large city school district."[4] The entire State of New York had adopted PPBS in 1964, and the municipal government of New York initiated PPBS in 1967, so that the de-

cision of the School District was an extension of earlier efforts. Because of its fiscal dependence status, the School District's policies tend to follow those of the City Government.

Pursuing a strategy sharply different from that of other government units which are installing PPBS,[5] New York City's ". . .overall approach has deliberately, been opportunistic, rather than systematic and comprehensive. We have concentrated our efforts on analysis, rather than on program structure and accounts, and we have focused on sectors of high apparent yield."[6] A partial justification for this approach is that the massive effort to classify City expenditures by program category and to articulate and quantify all programs' objectives might suffocate the basic intent of rational planning.

The City suggested that a number of factors contributed to its limited capacity to engage in conceptual budgeting: 1) absence of a highly developed budget making apparatus; 2) inadequate information systems; 3) lack of personnel and inexperience in program planning; 4) centralization of budget control; 5) line-item basis for budget construction and administration; 6) predominance of established practice in key municipal programs (e.g., police, fire, education); and 7) lack of funds for innovation and experimentation.

A number of first steps were taken in 1967–68 towards the PPBS format which are suggestive of preliminary procedures needed for rational educational planning:

1. recruitment efforts to employ program analysts;
2. establishment of a Policy Planning Committee;
3. analysis of the capital and operating budgets by objective;
4. review of projects by community area within the City;
5. efforts to establish proximate goals for new projects;
6. establishment of a Division of Program Planning;
7. PPBS probes in key areas;
8. usage of cost-effectiveness procedures;
9. project information and scheduling systems; and
10. proposals for a Think Tank to analyze city problems.

In addition, the City hired Rand Corporation to do a six-month study of selected agencies. Rand, which conducted most of the initial research on PPBS for the Federal Government, committed more than five per cent of its 1968 budget to the problems of the City.

The City School District, with an expense budget exceeding $1.5 billion and serving more than 1.1 million pupils with 60,000 teachers, hopes that the new budgeting system will provide better accountability and guide the Board of Education in policy decisions. One objective was to obtain a breakdown of every function of the school system into component cost factors, so that policy makers could determine whether the amount allotted to each function, or general program, was yielding its stated objective in the most efficient manner. A second objective was to facilitate long-range planning. After a complete examination of alternative ways of achieving a given objective, the District hopes to be able to spell out in detail the objectives it seeks to accomplish over a five-year period and relate these to available resources.

TABLE III

SUMMARY OF A PROGRAM BUDGET RESEARCH PROJECT FOR A LOCAL SCHOOL DISTRICT [a]

	Function 1 Research of Overall System Design	Function 2 Cost Analysis Research	Function 3 Program Identification Research	Function 4 Accounting Procedures Research	Function 5 Budget Procedures Research	Function 6 Data Processing Applications Research	Function 7 Planning & Evaluation Procedures Research
Objectives	The preliminary design of organizational system conducive to the successful operation of the budget techniques.	To establish cost schedules of direct and indirect costs of instructional programs.	To identify present instructional programs as they relate to (1) Strategy of Education (2) cost accounting (3) program budget.	To design accounting procedures to accommodate cost accounting and the program budget for federal, state & local funds, and management requirements.	To design budgeting procedures which accommodate the program budget and exercise the best financial planning techniques.	To design an EDP sub-system which best satisfies the requirements of the Strategy of Education.	To design a planning and evaluation function under the superintendent.
Procedures	1-Identify goals 2-Determine support requirements 3-Synthesize organization 4-Design data flow and analysis system 5-Design evaluation procedures	1-Analyze instructional support function costs in terms of direct and indirect costs 2-Establish formulas for periodic revision of costs 3-Compose and publish initial cost schedules	1-Establish program definitions that accommodate goals, support organization cost, cost accounting, and program budgeting in terms of present instructional programs 2-Identify present programs for budgeting 3-Analyze future program objectives 4-Continued refinement of goal and program design	1-Determine all functions requiring accounting services and reports, internal and external 2-Determine accounting, personnel, payroll, purchasing and other interrelated functional procedures 3-Establish accounting procedures to satisfy all requirements	1-Determine the report requirements for federal, state and local agencies 2-Determine financial planning procedures for revenues and appropriations 3-Determine best procedures for budgeting programs 4-Design coordination procedures with planning & support functions 5-Establish budget presentation and review procedures	1-Analyze guidance from senior consultants, reference Step 1 2-Observe and analyze old and new organization to determine interim and planned CDP requirements 3-Design and develop EPD procedures which accommodate data flow plan of the senior consultant	1-Design procedures for goal revision and policy formation and dissemination. 2-Design planning function based on goal, policy, priority and resource allocation 3-Design an overall supporting system evaluation function including statistical analysis
Products Of Research	Preliminary report for establishing guidance for Steps 2 through 7	A manual of cost schedules appliable to programs with revision procedures	A list of programs which is adaptable to cost accounting budgeting & EDP	A manual of accounting procedures which accommodate the Strategy of Education	A manual of budget policies and procedures	A manual of optimum procedure description for data processing to meet all system requirements reference—Step 1	A manual of goal and policy formulation planning and evaluation procedures

[a]Dade County Public Schools, **A Program Budget Research Proposal** (Miami, Florida: Dade County Board of Public Instruction, November, 1966), p. 3. Permission to reproduce this was granted by E. L. Whigham, Superintendent, and Jack W. Whitsett, Project Manager for Support Systems, January 15, 1968.

A third objective is to decentralize budget administration, even though PPBS appears to possess a centralizing bias. The District's one and one-half billion dollar budget tends to be highly centralized for reasons of administrative efficiency.

The purpose of PPBS in the District is described thusly by the official in charge of the new program:

> It is the intent of PPBS to relate costs to objectives of the New York City School System. In that way, we can more realistically determine if we get maximum value for our dollar. Output measures, or what industry would call productive units, would be examined and financial resources reallocated, if desired results are not maintained.
>
> In addition, we are trying to bring costs down to the school level so that in the process of decentralizing New York City Schools we shall know, and the communities will know, what the total costs are for each school. It will be possible therefore, to reallocate resources even on the individual school level in an attempt to facilitate optimal achievement of the children.[7]

Initially, the District chose rather crude output measures; for example, high schools used eight output measures, and one representative school provided the following data:

1. Pupil attendance – 94.4%;
2. Extra-curricular pupil participation – 25%;
3. Number of diplomas granted –
   a. Academic 280
   b. General 360
   c. Other 100
   d. Not graduating 85;
4. Number of scholarships and awards earned – 65;
5. Pupils taking 5 or more major subjects – 30%;
6. Pupils with grade averages of 85% or more – 10%;
7. Number of pupils discharged:
   a. With employment certificates – 45
   b. 17 years of age and over – 35;
8. Test results:
   a. Metropolitan Achievement Tests (reading)
      (1) Mean grade equivalent – grade 9 = 9.6
          Mean grade equivalent – grade 10 = 10.4;
   b. Other test measures
      (1) Pupils passing Regents Exam – 75%
      (2) Pupils passing Uniform School Exam – 70%.

It is too soon to judge the worth of program budgeting in New York.

3. **Sacramento (Calif.) City Unified School District.** The Public Schools of

Sacramento operate within a program budget type of framework. This school district, with about 55,000 pupils and total expenditures of $37 million for 1967-68, prepares its budget in terms of three program areas: administrative services, instructional programs and services, and supporting services. The largest of the three program areas is instructional programs and services, and it is further subdivided, largely on a grade-level basis, into twelve programs: 1) instructional administration; 2) curriculum development; 3) special services; 4) special programs; 5) elementary schools; 6) junior high schools; 7) senior high schools; 8) schools for adults; 9) continuation high schools; 10) summer school programs; 11) staff training and summer demonstration school; and 12) special projects.

The Sacramento Schools' budget is a combination, or a hybrid, of a budget by programs and a program budget. By use of account codes in the computer, it is run in three formats: 1) by State required classifications, which is an object budget; 2) by programs, which is the working budget; and 3) in publication format for presentation to the Board of Education and to the public. Some programs, notably federal ones, include appropriations for indirect costs. Most programs include only appropriations for direct costs.[8]

As of 1968, it is probably accurate to state that there is insufficient evidence to predict the extent to which program budgeting and operations analysis procedures would be installed successfully in local school systems. Each of the projects described above was somewhat exploratory and is not yet a finished product. If they are evaluated by the same people who initiated them, they will be undoubtedly "doomed to success".

Alternative Program Structures

It would be premature to establish overall measures of effectiveness in local schools before suitable program structures have been devised. The very heart of the PPBS concept is the program structure, for it makes the outputs of a school visable and identifies the resources required to yield these outputs.

Where does one look for ideal-type program structures? Several program analysts have observed that "programs are not made in heaven"; rather, then are imposed on the natural world by man. There is no single best program format for schools. Inasmuch as Local Schools differ in organizational structure, size, clientele, staff expertise, pupil needs, and fiscal resources, they will probably also differ in the goals they specify, the curricular programs they offer, the priorities they assign to competing program elements, and in their achievement as measured by performance indicators.

There are at least three basic approaches to devising a program structure. The first is to use organizational, or grade level, categories. Programs might include: 1) early childhood, 2) primary grades, 3) intermediate grades, 4) middle school, 5) technical high school, 6) comprehensive high school, 7) junior college, 8) adult education, etc.

A second approach, and probably the ideal type, is to devise programs on the basis of curricular (subject-matter) organization. Direct and indirect costs are apportioned to subject areas, such as: 1) language arts, 2) science, 3) mathematics, 4) social science, 5) creative arts, 6) special education, etc. The third option is a hybrid format which combines grade level organization at the elementary level with subject-matter organization at the secondary level. Generally this reflects existing state certification procedures whereby instructors are certified as elementary teachers through grade six and as mathematics, language, or social studies teachers at the secondary level. The latter two approaches are the most desirable, yet most difficult type to develop, and so it is the first approach which is most widely used among the ten school systems mentioned earlier.

In conclusion, with this introduction to PPBS as to its limitations, conceptual and operational elements, development within the budgetary reform framework, and illustrative program budgeting installations, one can sense the value of such an approach for it sets the proper stage for systematic planning. It does not quarantee, however, that the play upon that stage will be a success.

FOOTNOTES

1. A detailed review of recent research literature and a discussion of the operational aspects of PPBS is contained in Harry J. Hartley, **Educational Planning-Programming-Budgeting: A Systems Approach.** Englewood Cliffs, New Jersey: Prentice-Hall, Inc., published in August, 1968.

2. Arthur Smithies, "Conceptual Framework for the Program Budget", **Program Budgeting: Program Analysis and the Federal Government.** ed. David Novick. Cambridge, Massachusetts: Harvard University Press, 1965, Chapter ii.

3. Taken from Hartley, **op.cit.**, Chapter iv.

4. Bernard E. Donovan, Superintendent of Schools, **Staff Bulletin,** The Public Schools of New York City, V, No. 5 (December 12, 1966), 1. A general description of the approach to be taken was provided in **PPB: An Introduction,** prepared by the Board of Education's PPBS Staff and the Stanford Research Institute, OPPB Bulletin No. 1 (June, 1967), 14 pp.

5. Fifteen governmental units are developing PPBS procedures as part of the State and Local Finances Project, which is supported by a grant from the Ford Foundation to the George Washington University. It consists of five states, five counties, and five cities.

6. Frederick O'R. Hayes, Director of the Budget, City of New York, **PPBS in New York,** September 19, 1967, p. 1. (Mimeographed)

7. Letter from Murray Hart, Assistant Superintendent for the Office of PPB, Board of Education of the City of New York, January 10, 1968.

8. Letter from Henry J. Moeller, Director of Budget Services, Sacramento City Unified School District, November 13, 1967.

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